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PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of

Stefan JOHANSSON et al.

Serial No. 09/889,734 Appeal No. ___________

Filed July 20, 2001 GROUP 2827

FLEXIBLE MICROSYSTEM AND BUILDING TECHNIQUES

APPEAL BRIEF

MAY IT PLEASE YOUR HONORS:

1. Real Party in Interest

The real party in interest in this appeal is the assignee, Piezomotors Uppsala AB of Uppsala, Sweden.

2. Related Appeals and Interferences

None.

3. Status of Claims

Claims 28-54 are pending, claims 1-27 having been cancelled. The pending claims are provided in the attached Appendix.

Claims 30, 34-38, and 45 have been withdrawn from further consideration as being drawn to non-elected subjected matter. Appellants had selected the embodiment of Figures 1-3 in the Response of March 5, 2002 (Paper No. 6).

Although Appellants believe claims 30, 34-38, and 45 read on the embodiment of Figures 1-3, the Examiner disagreed.

Accordingly, claims 28-29, 31-33, 39-44, and 46-54 stand rejected, either for formal or substantive reasons.

Formal Status

The Examiner (Official Action of November 11, 2002) has correctly objected to the dependency of claim 38. Claim 38 has been marked below to indicate the correct claim dependency. Note that this is one of the claims withdrawn from consideration.

Claims 31, 33, and 47 stand rejected under §112, first paragraph, as containing subject matter not described in the specification so as to reasonably convey, to one skilled in the art, that the inventors had possession of the claimed invention at the time the application was file.

Claims 41-43 stand rejected under §112, second paragraph, as being indefinite.

Substantive Status

Claims 31, 33, and 47 have been indicated to be directed to allowable subject matter.

Claims 28-29, 32, 39-44, 46, and 48-54 stand rejected as anticipated by SCOTT 6,118,072.

4. Status of Amendments

An Amendment after Final Rejection was filed on February 14, 2003 seeking to address the objection to claim 38 and the indefiniteness rejection. The Advisory Action of February 20, 2003 indicated that this Amendment would NOT be entered upon filing of a Notice of Appeal and an Appeal Brief.

Accordingly, the claims on appeal are 28-29, 31-33, 39-44, and 46-54, as presented in the Amendment of September 6, 2002.

5. Summary of Invention

The present invention deals with the reduction of parts and simplifying of the assembly for transducer microsystems, where a transducer microsystem is defined as a transducer system in which the size of any active transducer component is in the order of centimeters or less (see the preamble to independent claims 28, 44, and 48; and the first sentence of the Background section, specification page 1) and transducers are components or devices that transduce one energy form to another (see the second sentence of the Background section).

With reference to specification pages 3-4, the invention is a microsystem having a reduced number of

components and a more efficient and flexible microsystem assembly method using a flexible printed circuit board ("PC board") as: 1) a mounting support for electronics components and wiring, 2) for mechanically supporting various components, e.g., transducer components and 3) acting as a main structural member for the entire microsystem.

All components necessary for a microsystem may be mechanically mounted onto the flexible PC board. After mounting components, the flexible PC board is elastically deformed to a required final shape to provide the main structural member of the system, the flexible PC board being provided with geometrical structures for locking and/or adjustment of the final deformation of the flexible PC board.

Thus, the inventive transducer microsystem uses a flexible PC board as 1) the main structural member of the system, 2) a base for physically attaching electromechanical transducer components; and 3) providing electrical connections to the electromechanical transducer components (see the independent claims).

Advantageously, in the final shape, the resilience of the flexible PC board applies elastic forces on selected

transducer components. See the paragraph spanning specification pages 3-4.

One embodiment of the invention concerns a microelectromechanical motor comprising the inventive microsystem.

6. Issues

A first issue on appeal is whether claims 31, 33, and 47 were properly rejected under §112, first paragraph.

A second issue on appeal is whether claims 41-43 were properly rejected under §112, second paragraph.

A third issue on appeal is whether claims 28-29, 32, 39-44, 46, and 48-54 were properly rejected as anticipated by SCOTT 6,118,072.

7. Grouping of Claims

As to the first issue on appeal, claims 31, 33, and 47 stand together.

As to the second issue on appeal, claims 41-43 stand together.

As to the third issue on appeal, the independent claims 28 and 44 stand together; independent claim 44 stands alone as this claim recites a microelectromechanical motor.

The dependent claims stand with the claims from which they depend except for claims 29, 30, and 41.

8. Arguments

Arguments Concerning the First Issue

The Examiner takes the position that claims 31, 33, and 47 contain subject matter not described in the specification so as to reasonably convey, to one skilled in the art, that the inventors had possession of the claimed invention at the time the application was filed.

Specifically, the Examiner stated in Paragraph 4 of the November 20, 2002 Official Action that the specification did not convey to one of skill in the art that Applicants had possession of the claimed invention at the time the application was filed, i.e., "[t]he specification is silent regarding 'an elastic contact force (30, 32),' [recited] in line 3 [of claims 31, 33, and 47]".

The original disclosure (specification and claim set) shows otherwise. The paragraph spanning specification pages 3-4 discloses:

> The above objects are provided by a device and a method according to the enclosed claims. In general words, the present invention makes use of a flexible printed circuit board, not only as a mounting support for electronics components and wiring, but also for mechanically supporting various components as well as acting as a main structural member for the entire microsystem. All components necessary for a microsystem may be mechanically mounted onto a flexible printed circuit board, which finally is **elastically** deformed to a required final shape. In the final

> shape, the resilience of the flexible printed circuit board is used **to apply elastic forces** on selected transducer components of the microsystem.

The final paragraph of specification page 5 discloses:

> When the size of a system decreases, the rigidness of any main structural member may be decreased. For microsystems, which traditionally anyway are assembled on rigid structures, **elastic** constructions would be possible to use. Sheets of **elastic** materials may either by itself, or in a folded or deformed manner, be enough stable to constitute a main structural member.

Specification page 6 discloses:

> Furthermore, on a microscale, foils of **elastic** materials, such as flexible printed circuit boards, can be considered to be rather stiff in relation to the typical loads it should carry. However, in a macroscale, i.e. considering a whole microsystem, the foil can still be considered to be easily **deformable**, and do also provide a useful resilient behaviour. By reshaping portions or the whole flexible printed circuit board, final structural shaped may easily be obtained, which at the same time may be used for providing forces onto some transducer components. Transducer microsystems operating to move different members, normally uses different types of forces, mostly frictional forces, between the contact points of a drive unit and the drive member to achieve the motion. Means for creating such normal forces between different components have to be supplied. In a device according to the present invention, the flexible printed circuit board may also be used to accomplish these normal forces.

Specification page 9 discloses:

> The actual mounting of the components may also be supported by the flexible printed circuit board 10. In fig. 2, a narrow tab 32 of the material of the flexible printed circuit board 10 may be cut out and used as a **spring**. For small items, such as microelectromechanical components 22, the force necessary to fix the components in position is not very large. By using relatively **short resilient members 32** of the flexible printed circuit board 10, **the elastic spring force may be enough to hold the component in position.** If the tab 32 is covered with a conducting layer at the side facing the microelectromechanical component 22, an electrical contact may also be formed.

The paragraph spanning specification pages 9-10 discloses:

> The flexible printed circuit board 10 is **deformed** in a closed shell shape, which also may act as a casing for the microsystem. The flexible printed circuit board 10 also applies a force onto the microelectromechanical component 22, and this force may be used for achieving a **mechanical and/or electrical contact.** In both fig. 2 and fig. 3, a part of the flexible printed circuit board 10 is **elastically deformed,** and a microelectromechanical component 22 is positioned in the deformation path, whereby **the resilience of the deformed flexible printed circuit board 10 applies a spring force on the microelectromechanical component 22.**

The final paragraph of specification page 10 discloses:

> There are several different applications when the contact forces between the drive units and the drive member has to be very high. In that

case it is advantageous to use an external support structure that improves the stiffness. Fig. 4 illustrates such a case, where an external rigid member 36 is used as a counteracting means for achieving a strong resilient force. A portion of a flexible printed circuit board 10, on which microelectromechanical component 22 are attached, is deformed and pressed between the jaws of the external rigid member 36. The distance between the jaws is slightly less than the microelectromechanical components 22 and the flexible printed circuit board 10 in an uncompressed state, and the entering of the flexible printed circuit board 10 into the external rigid member 36 causes a part of the flexible printed circuit board 10 to be compressed 38. This compression gives rise to an **elastic force** by the board material itself, which force may be quite high. The flexible printed circuit board 10 is thus arranged with an **elastic deformation** 38 substantially perpendicular to its surface, between the microelectromechanical component 22 and the external rigid member 36, whereby the intrinsic material **elasticity** of the flexible printed circuit board 10 provides the **elastic contact force**. The **deformation** may of course also take place e.g. between different microelectromechanical components 22. The external rigid member 36 is in this case only used for produce the force, but may also be combined to constitute a part of the main structural member. Note that the dimensions in fig. 4 are drawn in a different scale, compared with most other figures.

The paragraph spanning specification pages 15-16 discloses:

Fig. 9 shows.... In step 110, the flexible printed circuit board is given its final shape by a **deformation step**, where the flexible printed circuit board is **elastically and maybe also plastically deformed** to accomplish a final structurally bearing shape. Geometrical structures providing locking means are in step

112 used for maintaining the deformation. In step 114, the locking is adjusted to achieve suitable positioning, forces and other properties of the microsystem. The process is finally ended at step 116.

The originally-filed claims make reference to the rejected recitations.

See that original claim 3 recited "...said flexible printed circuit board (10) has an **elastic deformation,** whereby said flexible printed circuit board (10) forms a general support for internal (30, 32) and external forces."

Also see that original claim 4 recited "...said flexible printed circuit board (10) is elastically deformed to apply an **elastic contact force (30, 32)** to at least one of said components (22) of said electromechanical transducer, forming a mechanical contact." Pending claim 31 is identical to original claim 4.

Original claim 6 recited "...said flexible printed circuit board (10) **is elastically deformed to apply an elastic contact force (30, 32)** to at least one of said electrical or optical components (24), forming an electrical contact." See the correspondence to pending claim 33.

Original claim 20 recited "...applying an elastic force to at least one of said components (22) of said

electromechanical transducer by reshaping at least a portion of said flexible printed circuit board (10)." This corresponds to pending claim 47.

From the above example extracts, it is clear that Appellants had possession of the recited invention at the time the application was filed.

Arguments Concerning the Second Issue

The Examiner maintains that claims 41-43 are indefinite, stating that the claim 41 phrase "said flexible printed circuit board (10) is provided with geometrical structures (16, 18, 20; 32, 33, 34; 40, 42; 44, 46, 48) which are engagable to other ones of said geometrical structures (16, 18, 20; 32, 33, 34; 40, 42; 44, 46, 48) and to other members of said transducer microsystem" is not understandable.

In the first full paragraph of specification page 4, it is disclosed that "the flexible printed circuit board is provided with geometrical structures, which are possible to use for locking and/or adjustment of the final deformation of the flexible printed circuit board. The mechanical attachment of the components for the microsystem to a flexible printed circuit board takes preferably place

with the flexible printed circuit board in a substantially two-dimensional state, whereby a final shape of the microsystem is achieved by deforming the flexible printed circuit board."

With reference to specification page 7 and Figure 1a, the flexible PC board 10 is provided with electrical leads 12 and contact pads 14 using standard techniques for normal flexible printed circuit boards. Additionally, geometrical structures 16, 18, 19, and 20 are disclosed. Slit 20 is cut a distance from one edge of the board and defines a tab member 19. In the tab member 19, two strips 16 with a set of rectangular openings are provided in one end. Close to the center of the tab member 19, two U-formed slit structures 18 are provided.

With reference to the first paragraph of specification pager 8 and Figure 1c, the tab member 19 may be deformed and bent in a cylindrical shape enclosing a shaft 28. The originally upper surfaces of monolithic piezoelectric drive units 22 are brought into mechanical contact with the shaft 28, and the tab member 19 is stretched to apply a force 30 onto the monolithic piezoelectric drive units 22, which force 30 is transferred to the shaft 28 by frictional means. The tab member 19 is

locked in a stretched position by means of the strips 16 and the U-formed slit structures 18, by introducing the tabs defined by the U-formed slit structures 18 into the rectangular openings of the strips 16.

Claim 41 recites the flexible printed circuit board provided with geometrical structures engagable to other ones of the geometrical structures and to other members of said transducer microsystem. The above page 8 disclosure is an example, i.e., strips 16 of tab member 19 are engagable to slit structures 18.

Similarly, with reference to specification page 9, the second and third paragraphs, together with Figures 2-3, a narrow tab 32 of the material of the flexible printed circuit board 10 may be cut out and used as a spring and to hold components in position. Geometrical structures include semicircular shape member 34. The semicircular members 34 can be forced through slits 33, whereby the semicircular members 34 are locked at the opposite side.

The claim 41 recitation that "said flexible printed circuit board (10) is provided with geometrical structures … which are engagable to other ones of said geometrical structures … and to other members of said transducer microsystem" is not indefinite as the words are

themselves clear and are further made clear by reference to the originally filed disclosure.

Arguments Concerning the Third Issue

The Examiner asserts that claims 28-29, 32, 39-44, 46, and 48-54 are anticipated by SCOTT.

The Independent Claims

In review, the present invention deals with the reduction of parts and simplifying of the assembly for a transducer microsystem, where the active transducer components are in the order of centimeters or less (see independent claims' preamble). This is achieved by using the flexible printed circuit board not only for electrical connections and for holding the individual components thereto, but also as the dominating portion of the mechanical structure keeping the transducer system together.

Independent claim 28 recites a transducer microsystem; independent claim 44 recites a microelectromechanical motor, comprising a transducer microsystem; and independent claim 46 recites as a method of assembling a transducer microsystem. These claims stand together except for claim 44 further requiring the transducer microsystem within a microelectromechanical motor.

By this invention, most structural parts, which would serve only as a support for the entire system, are eliminated by letting the printed circuit board also serve as an overall mechanical support for the entire system. This property is recited as a "main structural member", "main" having the meaning of major part, principal, dominating or most important, and "structural" having the meaning of means for supporting an essential framework.

The Examiner stated that SCOTT discloses a device (element 10; column 3, lines 62-67) capable of being a transducer microsystem.

This is not the case. SCOTT discloses a flexible circuit disposed within a conductive tube. Attention is directed to the first claim of SCOTT reciting a device, comprising an electrically conductive tube and a flexible circuit disposed within said tube. In SCOTT the teaching is to protect a circuit from external damage (physical and electrical fields) by enclosing the circuit within a conductive external tube. The tube provides a supporting framework for the circuit system located therein and is the recited main structural member. The flexible circuit is not a main structural member and, indeed, the flexible circuit

relies on the surrounding conductive tube to be the structural member.

SCOTT teaches a device including a flexible circuit disposed within a conductive tube such as filters, directional couplers, power dividers, amplifiers, microwave mixers, and microwave fuses. Accordingly, one of skill would understand that the SCOTT invention may relate to devices with flexible circuits. However, that said, the SCOTT invention is to protect a flexible circuit within a structurally and electrically protective tube. The SCOTT invention is not that of the present invention, and the independent claims of the present invention are not believed to read on SCOTT.

SCOTT does not disclose a transducer microsystem, a microelectromechanical motor comprising a transducer microsystem, or a method of assembling a transducer microsystem. The Examiner implicitly acknowledges this in stating "Scott discloses ...**capable of being** a transducer microsystem applied in micro-electromechenical motor (sic)...". This is because, although SCOTT discloses that their invention is directed generally to a device including a flexible circuit disposed within a conductive tube such as filters, directional couplers, power dividers, amplifiers,

microwave mixers, and microwave fuses, there is no teaching or suggestion of using the SCOTT invention with a circuit involving electromechanical transducers physically attached to the circuit board (serving also as the main structural member).

See that claim 28, the third recitation requires "a number of electromechanical components of an electromechanical transducer, physically attached to said main structural member...". At best, SCOTT may be capable of being the electronics part of a transducer system, but SCOTT does not disclose use with a transducer system comprising electromechanical transducers.

In any event, SCOTT does not disclose each recitation of the independent claims and therefore, the pending claims are not anticipated.

As to claim 28, see the initial two recitations of:

"a main structural member, constituting a dominating part of a supporting framework of entire said transducer microsystem;

"said main structural member being a flexible printed circuit board;...".

The Examiner reads these recitations onto flexible circuit 12 of SCOTT. SCOTT discloses a device 10 constructed to include a flexible circuit 12 disposed within an electrically conductive tube 14. The circuit 12 is bent and in tension engagement with the tube 14. In the embodiment shown in Figure 2, the circuit 12 has two bent portions 15, 16 connected by a straight center portion 17, giving the circuit 12 an "S"-shaped cross-sectional shape. The circuit 12 includes a flexible substrate 22 and circuit elements 24.

Thus, SCOTT discloses a flexible printed circuit board. However, SCOTT does not disclose that the circuit board 12 is a dominating part of a supporting framework of the entire transducer microsystem as recited. Again, apart from there being no disclosure of a transducer microsystem, SCOTT does not disclose the circuit board being a dominating part of the supporting framework of the SCOTT system. Clearly, to the extent that a supporting framework is disclosed, the conductive tube 14 is the supporting framework.

See the above, as well as SCOTT column 4, first paragraph disclosing "bent portions 15, 16 include sharply bent portions 18, 19, respectively, that act as cantilevered

springs to counter act each other, keep the straight portion 17 in tension, and secure the circuit 12 within the tube 14." The tube 14 provides the supporting framework of the SCOTT apparatus, not the circuit board 12. Accordingly, for this reason alone the anticipation rejection is not viable.

Further, see the last two recitations of claim 28:

"a number of electromechanical components of an electromechanical transducer, physically attached to said main structural member,

"said flexible printed circuit board comprising electrical connections to said electromechanical components of said electromechanical transducer."

For the recitation of electromechanical components, the Examiner offers elements 24, and column 4, lines 26-29:

> Many types of circuit elements 24 may be part of the circuit 12, including inductors, capacitors, resistors, diodes, and transistors. The circuit elements 24 may also include integrated circuits, including processors and application specific integrated circuits.

This passage does not disclose electromechanical components generally and does not disclose any electromechanical components of an electromechanical

transducer specifically, and accordingly SCOTT is not anticipatory.

See the first page of the present specification stating that "[t]ransducers are components or devices that transduces one energy form to another. Normally the transducers are divided in actuators and sensors even though there are many that can operate both as sensors and actuators. A sensor transforms an external stimulus to another useful energy form, preferably an electrical signal. An actuator essentially makes the opposite. A signal, preferably electrical, is transformed into any other useful energy form. Among the useful energy forms or external stimuli can be included mechanical, acoustic, electrostatic, electromagnetic, magnetic, optical, thermal, biological, biomedical, medical, chemical and atomic force energy. An electromechanical transducer is thus an actuator, transforming an electrical signal into a mechanical motion, and/or a sensor, transforming a mechanical motion into an electrical signal. Depending on application, the energy forms can be further subdivided e.g. mechanical transducers are typically divided into subgroups such as piezoelectric, electrostrictive, shape memory, inertial and resonant effects."

Nothing in SCOTT discloses use of "a number of electromechanical components of an electromechanical transducer." Thus, for this additional reason SCOTT is not anticipatory.

Independent claim 46 has the further requirement of "[a] microelectromechanical motor..." as per the preamble. Note that claim 47, depending from claim 46, recites that the motor operates according to inertia, resonant effect and non-resonant repetition of small steps.

The language of the claim 46 preamble should be given weight in order to distinguish the scope of claim 46 from claim 28, and also in view of dependent claim 47.

SCOTT does not disclose a microelectromechanical motor much less one that operates according to inertia, resonant effect and non-resonant repetition of small steps.

Accordingly, for this further reason, the rejection as to claim 46 is not viable.

The Dependent Claims

Claim 29 recites the transducer operating by shape memory. The Examiner indicates anticipation by elements 24, column 4, lines 26-29; however, this passage only lists

inductors, capacitors, resistors, diodes, and transistors. None of these are shape memory devices.

Claim 30 recites wherein "said flexible printed circuit board (10) has an elastic deformation, and said flexible printed circuit board (10) forms a general support for internal (30, 32) and external forces." Even if the SCOTT board is said to be a "main structural member", it can not be said to form a general support for internal and external forces.

Claim 41 recites "wherein said flexible printed circuit board (10) is provided with geometrical structures ... which are engagable to other ones of said geometrical structures ... and to other members of said transducer microsystem." Such structures are not found in SCOTT. The Examiner does not offer any SCOTT element as disclosing these recited geometrical structures.

The rejections as to each of claims 29, 30, and 41 are not believed to be viable.

9. Conclusion

In view of foregoing, it follows that: 1) the rejection of claims 31, 33, and 47 under §112, first paragraph; 2) the rejection of claims 41-43 under §112,

second paragraph; and 3) the rejection of claims 28-29, 32, 39-44, 46, and 48-54 as anticipated by SCOTT, are all improper and should be reversed.

Reversal of these rejections is accordingly respectfully solicited.

Respectfully submitted,

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10. Appendix

The claims on appeal:

--28. A transducer microsystem, being defined as a transducer system in which the size of any active transducer components is in the order of centimeters or less, said transducer microsystem comprising:

a main structural member, constituting a dominating part of a supporting framework of entire said transducer microsystem;

said main structural member being a flexible printed circuit board; and

a number of electromechanical components of an electromechanical transducer, physically attached to said main structural member,

said flexible printed circuit board comprising electrical connections to said electromechanical components of said electromechanical transducer.

--29. The transducer microsystem according to claim 28, wherein said electromechanical transducer operates by at least one physical effect selected from the list consisting of a piezoelectric, an electrostrictive, and a shape memory.

--30. The transducer microsystem according to claim 28, wherein said flexible printed circuit board (10) has an elastic deformation, and said flexible printed circuit board (10) forms a general support for internal (30, 32) and external forces.

--31. The transducer microsystem according to claim 28, wherein said flexible printed circuit board (10) is elastically deformed to apply an elastic contact force (30, 32) to at least one of said components (22) of said electromechanical transducer, forming a mechanical contact.

--32. The transducer microsystem according to claim 28, further comprising electrical components (24) or optical components attached to said flexible printed circuit board (10).

--33. The transducer microsystem according to claim 32, wherein said flexible printed circuit board (10) is elastically deformed to apply an elastic contact force (30, 32) to at least one of said electrical or optical components (24), forming an electrical contact.

--34. The transducer microsystem according to claim 30, wherein said elastic deformation comprises an elastic compression or tension substantially perpendicular to the surface of said flexible printed circuit board (10).

--35. The transducer microsystem according to claim 34, wherein said flexible printed circuit board (10) is arranged between a component (22) of said electromechanical transducer and at least one of a rigid support means (36), an electrical or optical component (24), and another of said components (22) of said electromechanical transducer,

wherein the intrinsic material elasticity of said flexible printed circuit board (10) provides an elastic contact force.

--36. The transducer microsystem according to claim 30, wherein said elastic deformation comprises an elastic deflection of at least a portion (19) of said flexible printed circuit board (10).

--37. The transducer microsystem according to claim 36, wherein said elastic deflection is a bending or a folding.

--38. The transducer microsystem according to claim [38] 36, wherein

a first component (22) of said electromechanical transducer is positioned in the path of said elastic deflection, and

the resilience of said deflected flexible printed circuit board portion (19) applies a spring force on said first component (22) of said electromechanical transducer.--

--39. The transducer microsystem according to claim 28, wherein said flexible printed circuit board (10) constitutes a casing of said transducer microsystem.

--40. The transducer microsystem according to claim 28, wherein said flexible printed circuit board (10) comprises a polyimide material.

--41. The transducer microsystem according to claim 28, wherein said flexible printed circuit board (10) is provided with geometrical structures (16, 18, 20; 32, 33, 34; 40, 42; 44, 46, 48) which are engagable to other ones of said geometrical structures (16, 18, 20; 32, 33, 34; 40, 42; 44, 46, 48) and to other members of said transducer microsystem.

--42. The transducer microsystem according to claim 41, wherein said geometrical structures (16, 18, 20; 32, 33, 34; 40, 42; 44, 46, 48) comprise holes, slits, pits, ridges, valleys or bumps.

--43. The transducer microsystem according to claim 41, wherein said geometrical structures (16, 18, 20; 32, 33, 34; 40, 42; 44, 46, 48) comprise adjustable locking structures.

--44. A microelectromechanical motor, comprising a transducer microsystem, being defined as a transducer system in which the size of any active transducer components is in the order of centimeters or less, said transducer microsystem comprising:

a main structural member, constituting a dominating part of a supporting framework of entire said transducer microsystem;

said main structural member being a flexible printed circuit board; and

a number of electromechanical components of electromechanical transducer, physically attached to said main structural member;

said flexible printed circuit board comprising electrical connections to said electromechanical components of said electromechanical transducer.

--45. A microelectromechanical motor according to claim 44, wherein said microelectromechanical motor operates according to one of the following motion principles:

inertia based, resonant effect and non-resonant repetition of small steps.

--46. A method of assembling a transducer microsystem, whereby transducer microsystem being defined as a transducer system in which the size of any active transducer components is in the order of centimeters or less, said assembling method comprising the steps of:

providing a main structural member, constituting a dominating part of a supporting framework of entire said transducer microsystem;

using a flexible printed circuit board as said main structural member;

physically attaching a number of electromechanical components of an electromechanical transducer to said main structural member; and

electrically connecting said electromechanical components of said electromechanical transducer to said flexible printed circuit board.

--47. The method of assembling a transducer microsystem according to claim 46, comprising the further step of applying an elastic force to at least one of said components (22) of said electromechanical transducer by reshaping at least a portion of said flexible printed circuit board (10).

--48. The method of assembling a transducer microsystem according to claim 46, comprising the further step of attaching electrical components (24) or optical components to said flexible printed circuit board (10).

--49. The method of assembling a transducer microsystem according to claim 46, wherein at least the major part of any steps of attaching components (22, 24, 26) to said flexible printed circuit are performed on a substantially flat flexible printed circuit board (10).

--50. The method of assembling a transducer microsystem according to claim 46, comprising the further

step of providing said flexible printed circuit board (10) with geometrical structures (16, 18, 20; 32, 33, 34; 40, 42; 44, 46, 48) engagable to other ones of said geometrical structures (16, 18, 20; 32, 33, 34; 40, 42; 44, 46, 48) and to other members of said transducer microsystem.

--51. The method of assembling a transducer microsystem according to claim 50, comprising the further step of locking said flexible printed circuit board (10) by said geometrical structures (16, 18, 20; 32, 33, 34; 40, 42; 44, 46, 48) to apply an elastic force to at least a first of said components (22) of said electromechanical transducer.

--52. The method of assembling a transducer microsystem according to claim 51, wherein adjusting said flexible printed circuit board by locking to apply an elastic force compensates for thermal, dimensional variations, adjusts mechanical resonances of said first component (22) of said electromechanical transducer, or adjusts the position of said first component (22) of said electromechanical transducer.

--53. The method of assembling a transducer microsystem according to claim 47, wherein said step of reshaping comprises at least one of the following steps:

elastically folding said flexible printed circuit (10);

elastically bending said flexible printed circuit (10); and

elastically tensing or compressing said flexible printed circuit (10) substantially perpendicular to its surface.

--54. The method of assembling a transducer microsystem according to claim 53, wherein the step of positioning a component (22) of said electromechanical transducer in the path of said elastic reshaping allows the resilience of said reshaped flexible printed circuit board portion (19) to apply a spring force on said electromechanical transducer component (22).--